PB83-175752

EPA (Environmental Protection Agency) Evaluation of the POLARION-X Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

(U.S.) Enviromental Protection Agency
Ann Arbor, MI

Aug 82

U.S. Department of Commerce
National Technical Information Service
NTIS

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(Please read Instructions on the reverse before completing)

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16. ABSTRACT

This document announces the conclusions of the EPA evaluation of the POLARION-X device under the provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act.

The evaluation of the POLARION-X device was conducted upon receiving an application from the marketer of the device. The POLARION-X is istalled in the fuel line between the pump and the carburetor. It incorporates two permanent magnets which subject the fuel to a magnetic field. This device is claimed to reduce emissions, to improve fuel economy and performance, to provide more complete combustion, to eliminate engine carbon buildup and dieseling, and to reduce the octane requirements of the engine.

The Environmental Protection Agency (EPA) fully considered all of the information submitted by the applicant. The overall conclusion was that for the POLARION-X there is no reason to expect that the device will improve either the emissions or fuel economy of a typical motor vehicle in proper operating conditions.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Automobiles Fuel Consumption Exhaust Emissions Tests	Fuel Economy Gas Saving Devices	

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by

Edward Anthony Barth

August, 1982

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Test and Evaluation Branch
Emission Control Technology Divison
Office of Mobile Sources
U.S. Environmental Protection Agency

EPA Evaluation of the POLARION-X Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

The Motor Vehicle Information and Cost Savings Act requires that EPA evaluate fuel economy retrofit devices and publish a summary of each evaluation in the Federal Register.

EPA evaluations are originated upon the application of any manufacturer of a retrofit device, upon the request of the Federal Trade Commission, or upon the motion of the EPA Administrator. These studies are designed to determine whether the retrofit device increases fuel economy and to determine whether the representations made with respect to the device are accurate. The results of such studies are set forth in a series of reports, of which this is one.

The evaluation of the POLARION-X device was conducted upon receiving an application for evaluation from the marketer of the device. This device is claimed to reduce emissions, to improve fuel economy and performance, to provide more complete combustion, to eliminate engine carbon buildup and dieseling, and to reduce the octane requirements of the engine. The device is a fuel line magnet.

The following is the information on the device as supplied by the Applicant and the resulting EPA analysis and conclusions.

1. Title:

   Application for Evaluation of POLARION-X under Section 511 of the Motor Vehicle Information and Cost Savings Act

2. Identification Information:

   a. Marketing Identification of the Product:

      POLARION-X Fuel Treatment Part No. 11587

   b. Inventor and Patent Protection:

      (1) Inventor

      Albert J. Kovacs
      1929 H
      South Pasadena, CA 91030

      (2) Patent Pending

      Patent Application Serial No. 207,644 relating to "MAGNETIC DEVICE FOR TREATING HYDROCARBON FUEL". The patent application is Attachment A.

   c. Applicant:

      (1) AZ Industries, Inc.
      28065 Diaz Road
      Temecula, CA 92390

(2) Principals

LaVern (Les) L. Adam, President
31315 Via Norte
Rancho, CA 92390

Lawrence E. Beard, Vice President
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Dale V. Diver, Secretary
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Robert L. Arnold, Treasurer
935 Roanoke Road
San Marino, CA 91108

Albert J. Kovacs, Consultant
1929 H
South Pasadena, CA 91030

(3) LaVern Adam is authorized to represent AZ Industries in communications with EPA.

d. Manufacturer of the Product:

(1) Name and address

AZ Industries, Inc.
28065 Diaz Road
Temecula, CA 92390

(2) Principals

LaVern (Les) Adam, President
Lawrence E. Beard, Vice-President
Dale V. Diver, Secretary
Robert L. Arnold, Treasurer
Albert J. Kovacs, Consultant

3. Description of Product (as supplied by Applicant):

a. Purpose:

"The present device is a magnetic unit for treating hydrocarbon fuel and an improvement on previous electromagnetic devices developed with Saburo Miyata Moriya in that it requires no outside source of energy and therefore is a means to conserve energy."

b. Theory of Operation:

"It is a well established principle that an electric field will promote combustion, increase vaporization and heat transfer. Many papers have been presented by the JSME and a list of Dr. Asakawa's papers are enclosed in the letter of July 6, 1981 to Dr. John Chao, Senior Motor Vehicle Pollution Engineer of the California Air Resources Board which explains in detail the theory of operation." This letter and its enclosures were contained in the application as an exhibit. It transmitted a number of documents to CARB. The pertinent ones have been incorporated in this evaluation as attachments.

c. Construction and Operation:

"Information is in letter of July 6, 1981 and contains data for this subsection c) under POLARION-X GAS SAVER UNIT, BLOCK DIAGRAM, installation instructions and Patent Drawing." (Attachments A, A-1, D, and E).

4. Product Installation, Operation, Safety and Maintenance (as supplied by Applicant):

a. Applicability:

"The EPA Fuel Economy Estimates, Second Edition, February 1981 California has been marked up to indicate those vehicles which the device is suitable. The device can be connected into all fuel line systems of carbureted engines and is not suitable for fuel injection, gasoline or fuel injection, diesel. Part No. 11587 is applicable to all carbureted engines." This copy of the EPA Fuel Economy Guide was marked to indicate that the device applied to all 1981 California vehicles with carbureted gasoline engines.

b. Installation - Instructions, Equipment, and Skills Required:

(1) "General instructions are contained in installation instruction brochure and provide two ways to install unit, with or without cutting existing fuel line.

(2) "Unit is a universal model fitting vehicles with carburetors only.

(3) "Tools required are a knife or scissors to cut hose or hoses to proper length, pliers and a screwdriver for unloosening existing clamps and tightening new clamps.

(4) "No equipment required to check the accuracy of the installation.

(5) "No adjustments to vehicle or vehicle systems as well as the device following installation. (California mandates no deviations from factory settings and specifications.)

(6) "Skills associated with the installation of the device would be those possessed by the average do it-yourself person who services his own car and is capable of minor repairs such as adjusting fan belts, removing and replacing air, oil and gasoline filters, etc."

c. Operation:

"The unit is furnished with installation instructions and a brief explanation of the history and principles of the magnetic fuel treatment device for use on engines equipped with carburetors."

d. Effects on Vehicle Safety:

"No effect on vehicles or occupants have been observed since the supervised testing program was initiated at California State University of Los Angeles beginning in January 1980 on 10 vehicles driven by graduate students, faculty and technicians. Independent testing laboratories; Automobile Club of Southern California; Transportation Testing, Inc. of Texas; USAC, (IMS), Speedway, Indianapolis have reported no unsafe conditions resulting from installing. Total of 33 cars have had units installed for testing purposes with no record of any unsafe condition. Additional backup data in Exhibit No. 5 supports no hazardous conditions have occurred dating back to original electromagnetic models which have been sold since early in 1962." Exhibit No. 5 was a copy of the EPA/DOE 1981 Gas Mileage Guide for California and contained no information about the device.

e. Maintenance:

"No maintenance is required on the unit except periodic inspection of hose connections."

5. Effects on Emissions and Fuel Economy (submitted by Applicant):

a. Unregulated Emissions:

"See exhibit, letters from Ed Payne, Vice President and General Manager of Transportation Testing Incorporated of Texas dated September 3, 1981 to Al Kovacs, Azaka Co., inventor, on fleet vehicles used in their testing operations which were equipped with the fuel treatment unit. Some are vehicles used in the 50,000 mile reliability testing but not individually identified. Approximately 15 vehicles are equipped with fuel treatment units, accumulating mileage and are checked weekly on an exhaust gas analyzer."

b. Regulated Emissions and Fuel Economy:

"Test data supplied as noted - Exhibit No. 8".

6. Analysis

a. Identification Information:

(1) A copy of the patent application, Attachment A, was provided by the applicant (Attachment J) in response to the EPA request (Attachment H) for additional information about the device.

b. Description:

(1) The primary purpose of device as given in Section 3a did not give a clear purpose for the device. EPA twice requested (Attachments H and L) the applicant to clarify the purpose.

The purpose was finally clarified to be (Attachment N):

"The purpose of the Polarion X Gas Unit is:

1. Increase fuel economy
2. Reduce exhaust emissions
3. Eliminate carbon build up
4. Permit use of lower octane rated gasoline
5. Increase engine performance
6. Eliminate after running or dieseling"

The installation brochure (Attachment E) also states that the device promotes fuel vaporization, provides more complete combustion, and improves the combustion rate.

(2) The theory of operation given in Section 3b refers to the use of an electric field to "... promote combustion, increase vaporization, and heat transfer." The exhibits also refer to electrical devices. However, since the POLARION-X is a magnetic device, the applicability of this information was not apparent and EPA requested the applicant to clarify how his magnetic treatment of the fuel would beneficially affect emissions or fuel economy.

Despite numerous requests and responses, the applicant was unable to adequately explain the theory of operation for the POLARION-X (see Attachments H, J, L, N, O, and P). During a follow up phone call by EPA, the applicant finally stated that it was difficult to explain the theory by which the device works, that it worked by molecular theory.

Therefore, there is no sound technical basis to believe the POLARION-X has a beneficial effect on either emissions or fuel economy. EPA is not aware of any information that demonstrates that magnetically treating the fuel will affect emissions or fuel economy. The applicant was unable to provide a technically sound theoretical explanation that adequately described the beneficial effects of the device.

(3) The description of the device as described by the documents listed in Section 3c, the block diagram (Attachment A-1), installation instructions (Attachment E), and patent drawing (Attachment A) provided an adequate description of the construction and claimed method of operation of the device.

However, because the applicant stated in Section 3a that this device was ". . . an improvement over previous electromagnetic devices developed . . .", EPA requested (Attachment H) the applicant to describe these improvements in greater detail. The applicant provided the following description of the differences:

> "The improvement is based on the increased magnetic lines of force with the placement of the magnet element. The previous ION-X and ATOM-X electromagnetic units produce approximately 450 gauss at the center of the unit. The POLARION-X unit measures approximately 750 gauss at the magnet surface and 1500 gauss equidistant between the surfaces .060 inches apart.
>
> "Improvements of the magnetic unit over earlier electromagnetic units are (1) increased gauss readings, (2) no electrical potential required to activate the electromagnets and conserving energy from not being connected to the alternator, (3) the magnet unit cannot cause a spark which is a possibility with an electromagnet, (4) ceramic magnets are capable of operating at engine compartment temperatures." See Attachment J.

(4) According to the specific claims for the device "Emissions - Depending on engine conditions, can be reduced in a range from 5% to 10% for CO, 2% to 10% HC. Gas mileage improvements as measured by SAE methods 5%. Increased performance measuring various engine parameters 10%." (Applicants response (Attachment J) to EPA request (Attachment H) for specific claims for the device.)

(5) According to the applicant (Attachment J), the suggested retail price of POLARION-X IS $35.00.

c. Installation, Operation, Safety and Maintenance:

(1) Applicability:

The applicability of the product as stated in the application, to esentially all carbureted gasoline powered vehicles is judged to be reasonable. That is, it is possible to install the device on these vehicles. In Attachment K, the applicant also stated that a new design was being developed for gas and diesel injection systems.

(2) Installation - Instructions, Equipment and Skills Required:

The installation brochure (Attachment E) adequately describes the installation of the device. The applicant's statements, Section 4b, about the tools, equipment, and skills required for installation appear reasonable. The installation is relatively simple and should require no more than 15 minutes in most applications

There are, however, several aspects of the installation that were overlooked by the applicant.

Installation of the device requires additional hardware that is not provided with the device. According to the applicant (Attachment J), this "Additional hardware is not supplied due to the various engine configurations. Hoses and clamps of proper size are readily available for specific engines from auto parts shops."

Although the application clearly stated in Section 4b(5) that no post-installation adjustments are required, the installation instructions state that "Slightly less fuel is used if the carburetor is adjusted when you have a tune up to take advantage of the magnetic effect." EPA requested (Attachment H) the applicant to explain what was this adjustment, how was it made, and to explain this apparent inconsistency between the installation instructions in the application and those provided with hc device. In Attachment J, the applicant informed EPA that:

> "A tune-up is strongly recommended at time of installation. California prohibits any deviation from factory specifications for tune-ups. In states where adjustments are permitted a slightly leaner setting can be made. After the unit is installed and approximately 500 miles is accumulated full economy increase can be measured and emission byproducts are reduced."

Therefore, it appears the instructions provided with the device are slightly misleading and do not inform the purchaser how to adjust the carburetor ". . . to take advantage of the magnetic effect."

(3) Operation:

The applicant refers to the installation instructions for operating information. These instructions make no reference to the necessity for a mileage accumulation prior to obtaining a benefit. However, the "Abstract of Development of POLARION-X" states "Most engines would require preconditioning periods of up to 1000 miles before optimum fuel mileage was obtained." EPA requested (Attachment H) the applicant to clarify these statements. The applicant's response (see Attachment J)

> "Depending on carbon deposits in the engine, most vehicles require 2 to 3 tanks of fuel to be consumed to clean out the engine and as this occurs gas mileage increases. Assuming the average car tank capacity provides 250 to 350 miles range, 2 to 3 tanks are approximately 500-1050 miles to show results. Yes, some vehicles show immediate benefits the first day. Benefits are observed after the unit is removed. This is confirmed by test vehicles with and without devices which are switched halfway between the test program and by exhaust emission readings of HC and CO which remained lower after completion of test programs."

indicates that mileage accumulation with the device is required before the device would be expected to have an observable benefit.

(4) Effects on Vehicle Safety:

Based on the patent application description and the installation instructions, the device is judged to be capable of being fabricated to be safe in normal vehicle usage.

(5) Maintenance:

The applicant's statement that no maintenance is required, except for periodic inspection of hose connections, is judged to be correct.

d. Effects on Emissions and Fuel Economy:

(1) Unregulated Emissions:

The applicant submitted no test data and made no claims regarding unregulated emissions. The statements and data supplied in Section 5a relate to regulated emissions and fuel economy only. However, since the device does not modify the vehicle's emission control system or powertrain, the device should not significantly affect a vehicle's nonregulated emissions.

(2) Regulated Emissions and Fuel Economy:

The applicant did not submit test data in accordance with either the Federal Test Procedure or the Highway Fuel Economy Test. These two test procedures are the primary ones recognized by EPA for evaluation of fuel economy and

emissions for light duty vehicles.*

After numerous telephone and written requests (Attachments H, I, K, M, O, P, Q, and S) coordinating the testing of the POLARION-X, the applicant notified us that the device had been tested at an independent laboratory. Although he has not provided the actual test results, he verbally informed us that the tests did not show a benefit for the POLARION-X device.

As noted in Section 6b(2) EPA is unaware of any information that provides a technical basis to support the claim for improved emissions and fuel economy for an in-line fuel magnet device like POLARION-X. EPA previously tested and evaluated a similar product known as Super-Mag Fuel Extender (EPA-AA-TEB-511-82-3) and provided a copy of the report to the applicant (Attachment M). This device also showed no emissions or fuel economy benefit.

7. Conclusions

EPA fully considered all of the information submitted by the applicant. The evaluation of the POLARION-X device was based on that information and the results of the EPA confirmatory test program of a similar device.

The information supplied by the applicant was insufficient to adequately substantiate either the emissions or fuel economy benefits claimed for the device.

EPA is unaware of any data that demonstrates that magnetically treating a hydrocarbon fuel prior to induction into a combustion chamber is able to beneficially affect emissions or fuel economy. The previous EPA testing of Super-Mag, a similar device, showed no emissions or fuel economy benefits. Therefore, based on this information and on our engineering judgement, it is concluded that there is no technical basis to justify an EPA confirmatory test program on the POLARION-X device or to support any claims for an emissions or fuel economy benefit due to its use.

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*The requirement for test data following these procedures is stated in the policy documents that EPA sends to each potential applicant. EPA requires duplicate test sequences before and after installation of the device on a minimum of two vehicles. A test sequence consists of a cold start FTP plus a HFET or, as a simplified alternative, a hot start LA-4 plus a HFET. Other data which have been collected in accordance with other standardized procedures are acceptable as supplemental data in EPA's preliminary evaluation of a device.

FOR FURTHER INFORMATION CONTACT: Merrill W. Korth, Emission Control Technology Division, Office of Mobile Sources, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, 313-668-4299.

List of Attachments

Attachment A	Patent Application (provided as an attachment to November 30, 1981 letter to EPA).
Attachment A-1	Block Diagram of Magnetic Unit (provided with 511 application).
Attachment B	"Abstract of Development of POLARION-X", dated July 1, 1981 (provided with 511 application).
Attachment C	Background Data on Magnetic Fuel Treatment (provided with 511 application).
Attachemnt D	POLARION-X GAS SAVER UNIT SPECIFICATIONS by Albert J. Kovacs, the inventor of the device.
Attachment E	POLARION-X installation brochure and warranty, the pamphlet also contains history and principles of operation (provided with 511 application).
Attachment F	Letter of September 3, 1981 from Ed Payne, Transportation Testing of Texas, to Al Kovacs, a consultant of AZ Industries (provided with 511 application).
Attachment G	Letter of September 23, 1981 from Ed Payne, Transportation Testing of Texas to Dale Diver of AZ Industries (provided with 511 application).
Attachment H	Letter of October 26, 1981 from EPA to LaVern Adam of AZ Industries acknowledging receipt of 511 application for the POLARION-X and requesting clarification and additional information.
Attachment I	Letter of October 27, 1981 from EPA to LaVern Adam of AZ Industries describing procedures for testing at an independent laboratory by the applicant.
Attachment J	Letter of November 30, 1981 from LaVern Adam of AZ Industries to EPA in response to EPA request for clarification and additional information about the device.
Attachment K	Letter of December 11, 1981 from LaVern Adam of AZ Industries to EPA requesting EPA to comment on two quotations and to assist in developing a test plan.
Attachment L	Letter of December 14, 1981 from EPA to LaVern Adam of AZ Industries requesting clarification and information for items not fully covered by prior response (Attachment J).

Attachment M	Letter of December 18, 1981 from EPA to LaVern Adam of AZ Industries responding to request to comment on proposal testing.
Attachment N	Letter of January 15, 1982 from LaVern Adam of AZ Industries to EPA responding to EPA request (Attachment L) for information and clarification.
Attachment O	Letter of January 21, 1982 from EPA to LaVern Adam of AZ Industries reiterating EPA's request for information.
Attachment P	Letter of March 9, 1982 from EPA to LaVern Adam of AZ Industries notifying applicant that EPA would shortly close out the evaluation if adequate test data wasn't provided.
Attachment Q	Letter of March 24, 1982 from Dale V. Diver of AZ Industries to EPA which provided a copy of the POLARION-X test plan.
Attachment R	Letter of March 25, 1982 from Albert J. Kovacs, a consultant of AZ Industries, to EPA providing information and data on POLARION-X.
Attachment S	Letter of April 5, 1982 from EPA to LaVern Adam of AZ Industries commenting on the test plan for POLARION-X.

Attachment A

POLARION-X

Patent Application No. 207,644 for "Magnetic Device for Treating Hydrocarbon Fuels"

This document contains several pages which may not have reproduced well. The "Abstract of the Disclosure" and drawings of the device were extracted from this document and are given below.

MAGNETIC DEVICE FOR TREATING HYDROCARBON FUELS

Abstract of the Disclosure

A magnetic device for treating hydrocarbon fuel, including a passageway having an inlet and an outlet for the passage of the hydrocarbon fuel, a pair of elongated magnets and with each magnet magnetized to have one pole extending along one longitudinal face and the other pole extending along the opposite longitudinal face, the pair of magnets located along and on opposite sides of the passageway and with the faces of the magnets having like poles spaced from and substantially parallel to each other, and the pair of magnets providing a substantially unipolar flux field on fuel flowing in the passageway.

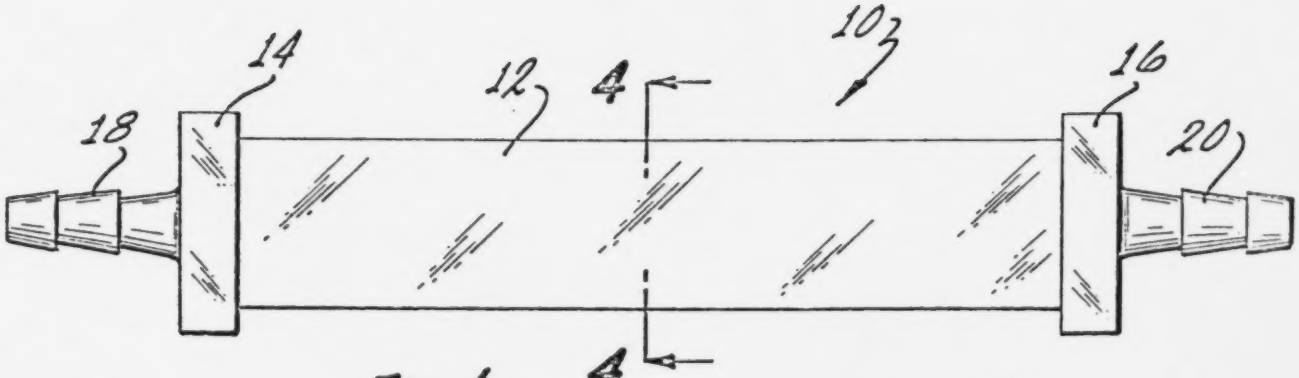


Fig. 1

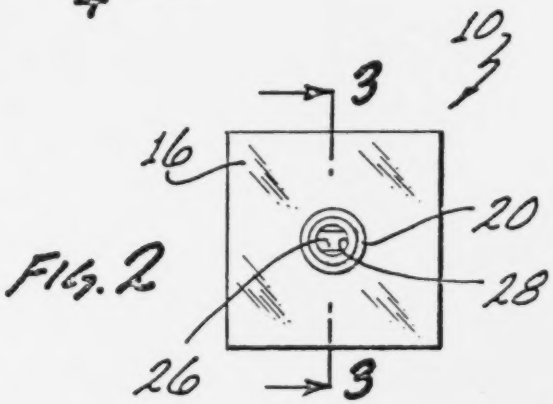


Fig. 2

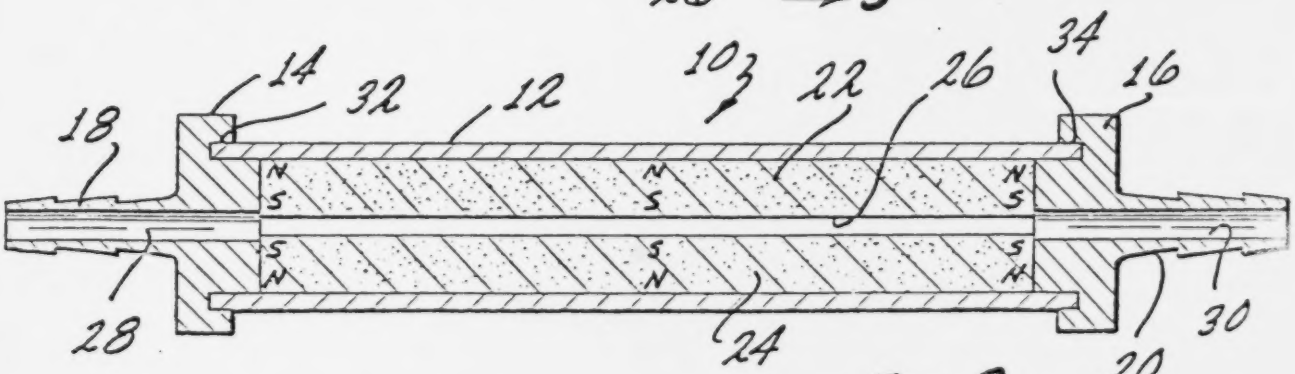


Fig. 3

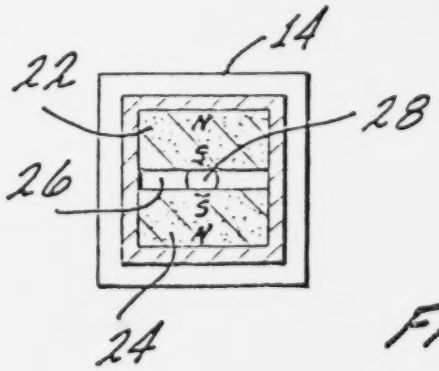
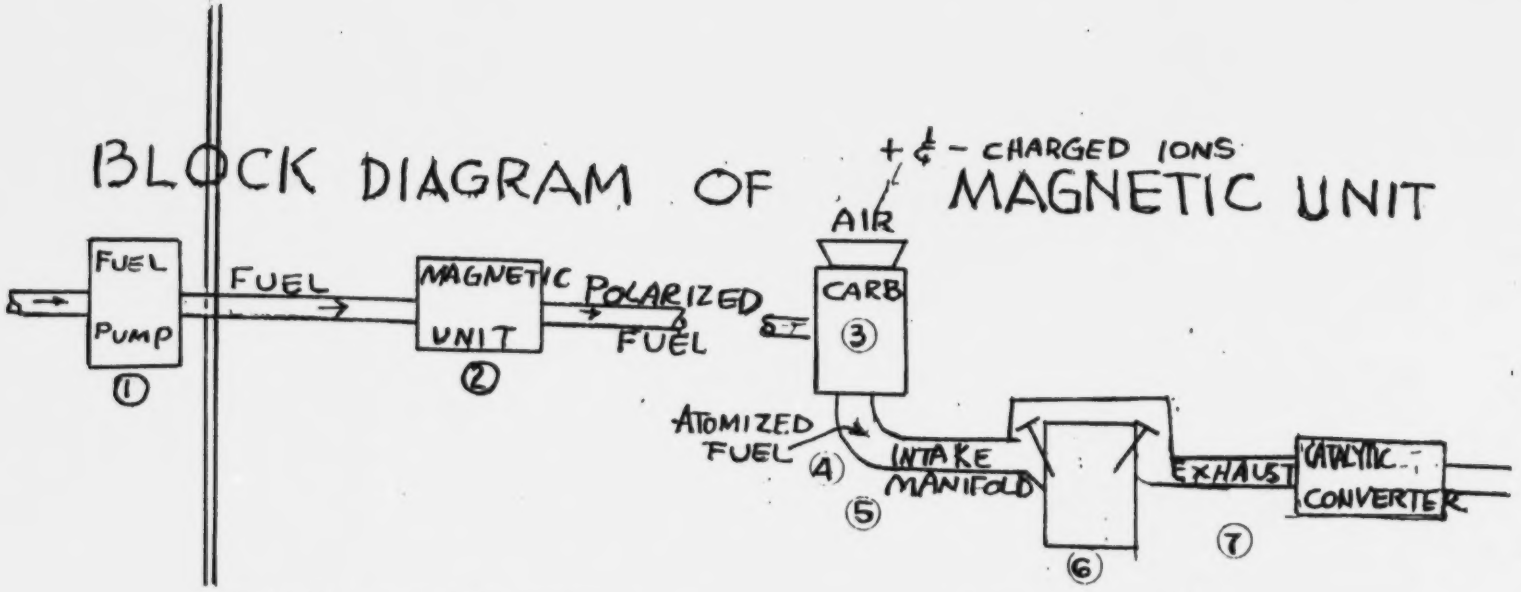


Fig. 4

BLOCK DIAGRAM OF MAGNETIC UNIT



1. UNLEADED FUEL PUMPED TO MAGNETIC UNIT.
2. UNIT PLACES MAGNETIC CHARGE ON FUEL.
3. CHARGED FUEL MIXED WITH AIR-POSITIVE & NEGATIVE CHARGED.
4. ATOMIZED FUEL - LIKE CHARGES REPEL FROM MANIFOLD
5. UNLIKE CHARGED FUEL/AIR PARTICLES ATTRACTED.
6. COMBUSTION PROCESS PROMOTED BY POLARIZED FUEL
7. MORE COMPLETE COMBUSTION-GREATER EFFICIENCY-LESS EMISSIONS.

ATTACHMENT A-1

ATTACHMENT B

July 1, 1981

Abstract of Development of POLARION-X

During the Korean War, while serving as a consultant to the USAF and the Japanese government, my duties required detailed R&D in the field of EMI (Electromagnetic Interference) for our global communication systems. Out of this grew a background of knowledge of magnetism, electromagnetic fields and more recently, electrogasdynamics. Since 1946 I have been involved in the design of electrostatic industrial equipment.

In 1961 a Japanese associate brought a electromagnetic device which he had invented, and for which he had been granted US patents, to the US and I assisted him in efforts to make the device. It was tested by industrial corporations, several of which took out agreements to distribute the device. Federal and state agencies also tested the device and made recommendations that it be used on general purpose vehicles. However, due to the 25¢ per gallon price of gasolene there was little interest in fuel economy or increased performance with 100 octane fuel. He returned to Japan to manufacture and sell his device in the Orient and in Europe.

About 1970 the ceramic type Alnico magnet prices became cost competitive with the barium ferrite magnet and we planned to develop improved models but he became ill and closed his factory. Several more US patents were granted on the improvements.

In 1975 I was able to develop a magnetic model which was more powerful than his electromagnetic device and cheaper to manufacture. In 1977 I submitted an unsolicited proposal to the Energy Research and Development Administration for a grant to develop a engineering model and to study the effects of electromagnetic fields on hydrocarbon fuels. No grant was available from ERDA but

NASA's Lewis Research Center, Cleveland, Ohio and JPL, Pasadena awarded a grant to the Mechanical Engineering Department, California State University Los Angeles and I have a contract to furnish consulting services in their diesel fuel program to treat diesel fuel with electrostatic and electrogasdynamic methods.

R&D on the magnetic unit to treat gasolene, gasohol and methanol involved the study of magnetic fields on the combustion rate using small laboratory gasolene engines and starting in January 1979 in the Auto Labs, Industrial Studies Department at CSULA a 1977 Datsun, 2000 cc Pickup was instrumented for field testing on the freeways. The Automobile Club of Southern California assisted in laying out a freeway loop, furnishing a 5th wheel for accurate mileage recording and dynamometer. Testing was done in the Auto Lab to measure fuel/air ratios, fuel consumption, emissions and performance parameters to establish base line data.

Various models of magnetic units were designed to study their effect on fuel consumption by driving the freeway loop with and without the unit attached. A patent was applied for at this time when other vehicles were also base lined on dynamometers and driven over the freeway loop. The smallest vehicle was a 1976 Honda, 1400 cc 2 door sedan and the largest, a Mercury 1972 429 cid4 door sedan. Fuel economy increases ranged from 8% to 15% on 6 vehicles tested.

During this period outside consultants were engaged, Dr. Peter Campbell of the USC Electrical Engineering Department and AZ Industries which furnished magnets with special characteristics to optimize the magnetic field effect on hydrocarbons. AZ Industries also made studies and recommendations of the most cost effective configurations of units to fit domestic and foreign fuel systems. Since most of the testing was done on the freeway system, we wanted to have an independent laboratory make fuel economy tests on a closed course or a track. The Goodyear test track was recommended. It is now the Transportation Testing

Inc. of Texas at San Angelo, Texas. They conducted a series of tests using a fleet of 8 cars accumulating a total of over 25,000 miles of driving on their test track. The preliminary report was favorable so an additional test was conducted. The conditions were to place POLARION-X units on the control vehicles which were without units to see if these vehicles were benefited to the same degree. An additional 25,000 miles has been accumulated for a total of 50,000 miles. This would also provide a reliability test of the POLARION-X units under actual service conditions.

Development of the earlier electromagnetic fuel treatment devices revealed characteristics of the effects of electromagnetic fields on gasolene powered I.C. engines. The devices did not immediately show an increase in MPG. Most engines would require preconditioning periods of up to 1,500 miles before optimum fuel mileage was obtained. The head was removed to photograph the carbon build up and deposits. After 1,000 miles the head was again removed and photographed showing removal and changes in the carbon deposit. In many engines the ignition timing was advanced and a lower octane fuel could be used without detonation. Easier starting was observed in many cases. Much of this was documented for oil companies in Japan and dynamometer readings showed HP increase attributable to the electromagnetic device. Similar observations with the present magnetic unit have been noted but no claims have been made until comparable tests have been repeated. Surveys show buyers are not interested in these other benefits except for the MPG increase with the magnetic unit.

My Japanese associate continued to make improvements in the fluid and fuel treatment devices, receiving over 25 US and foreign patents for these improvements, however only 3 or 4 models or configurations were manufactured during the 1960's in Japan and sold in Japan and Europe. He also manufactured and distributed barium ferrite magnets for the electronics industries until he become ill in 1970 but

continued R&D in electromagnetics with patents being granted as late as 1974.

Concurrently, with his consultant, Dr. Yukichi Asakawa who was then Director, High Tension Laboratory, Nikon University, Tokyo, Japan the principles of electromagnetics and electrostatics were used to develop concepts and working models for various applications for hydrocarbon fluids, thermodynamics, promotion and retardation of heat transfer, automotive engines and systems. Dr. Asakawa also has numerous US patents for promotion of combustion, vaporization and heat transfer used in industrial applications and equipment.

When the energy shortage occurred in 1974 it was brought to the attention of ERDA that there were many papers on energy conservation in Japanese which were not translated into English. The Japanese associate and myself had several scientific papers translated to support US patent filings on the effect of electric fields on combustion, vaporization and heat transfer. NASA officials read the proposal to treat hydrocarbons and assisted in developing the present program at CSULA, Mechanical Engineering Department to study the effects of electrostatics on diesel fuels.

Azaka Company and AZ Industries, Inc. feel a significant break through is occuring in carrying on the development of strong magnetic fields to treat hydrocarbon fuels such as gasolene, diesel fuels and combustible gases to obtain more energy by more efficient fuel combustion and to seek new ways to conserve energy.

BACKGROUND DATA ON MAGNETIC FUEL TREATMENT*

The use of magnetic and electromagnetic fields to influence physical and chemical reactions is well known and has many industrial applications as in electrostatic printing (Xerox), audio and recording tape for video and television, electrostatic precipitation of dust particles, electric motors, electronic and electronic control systems are examples.

Magnetism is used in four basic forms in the treatment of hydorcarbons and hydrocarbon fuels.

1) Permanent magnets
2) Electromagnets
3) Electrostatics
4) Electrogasdynamics

An electrical field has the effect of promoting combustion, vaporization and heat transfer by increasing the combustion rate. When the rate is increased, more complete combustion takes place in increasing efficiency, cleaner burning and less combustion by-products.

The development of cermets (ceramic magnets) capable of operating at higher temperatures without losing the magnetic efficiency such as occurs with other types of magnets such as ferrites has for the first time made possible the use of cermets without the addition of a magnetic field. An electromagnet is needed for increased temperatures to compensate for the loss of magnetic efficiency, in the modern auto engine compartment 250^{o} temperatures are usual; to maintain the magnetic field strength when ferrite or other types of magnets are used.

Ceramic magnets (cermets) are relatively new and have outstanding properties of stability, desirable magnetic composition, ease of manufacture and control of the grain structure and polarity orientation for specific applications. The particular capability of magnetizing in a manner to provide desired configurations of the magnetic fields not possible with other types and to have greater magnetic strength.

*This is a true copy of information provided by applicant; retyped for legibility.

Miniturization of electronic equipment is due in part in using these properties in the design of matnetic components.

For the past 5 years,investigation, R&D, field testing of magnets for treating fuels has been conducted to determine the optimum parameters of magnetic fields to effect polarization of hydrocarbons specifically gasolene, gasohol and diesel fuel. Much of the technical knowledge in electromagnetics and electrostatics was available from the paint and coating industry where spraying with electrostatic guns has been done for over 30 years. Hydrocarbon rheology and fluid mechanics, placing electrical charges on atomized fluid and air particles, polarizing molecules, are means to provide control of the atomization and heat transfer reactions.

The hydrocarbons and solvents used for catalyzation and polymerization are similar to the fluids used to provide combustion,atomization and heat transfer in the combustion process. We have developed with assistance from USC,Cal Tech, JPL,NASA at California State University Los Angeles the magnetic unit that provides fields strong enough to effect polarization of gasolene and are pursuing research on higher viscosity fuels.The units are now being field tested by independent laboratories serving the auto industry.

Transportation Testing Inc.of Texas,San Angelo,Texas is completing a 50,000 mile reliability and fuel consumption test, the 25,000 mile part is submitted as an enclosure. USAC Properties,Inc. Speedway,Indiana will have their test data available shortly on fuel economy tests conducted at the Indianapolis race track by the products testing division. Patent application drawing and data are included to clarify the details of the operation of the unit and how it works in the fuel system.

ALBERT J. KOVACS
PLANNING CONSULTANT
1929 FREMONT AVE.
SO. PASADENA, CA. 91030
PHONE 255-6122

POLARION-X GAS SAVER UNIT*

SPECIFICATION-
1. How the invention is constructed.
2. How it operates
3. How it is used

How the invention is constructed.

The unit consists of 7 pieces. The magnet assembly has 4 ceramic type magnets encased in a square aluminum tube, the magnets placed in the tube, 2 magnets in tandem, facing 2 magnets in tandem placed on the opposite side of the tube. The magnets are polarized to oppose each other so that magnetic particles are not attracted to the inner surface of the opposing magnets.

The 2 end caps of non-magnetic material are forced onto the ends of the tube (7th piece) and expoied in place to form a tight seal to prevent any leakage of the fluid passing through the unit. The orifices of the end caps are sized to correspond to the approximate inner space between the magnets to permit a smooth flow of fluid over the inner surfaces of the 4 magnets. The opposite side of the magnets are in direct contact with the inside of the tube and are kept in position by their repelling magnetic action and the end caps prevent any lateral movement.

There is no constriction of the flow of the fluid and the total inner open area is designed to match the fluid flows of the largest fuel pumps.

How it operates

The unit is installed in the engine fuel line between the fuel pump and as close to the carburetor as possible. It has no inlet or outlet markings, working with fluid entering from either direction so the unit cannot be installed incorrectly. The action of the fuel pump forces fuel into the unit and fills the chamber so the inner surfaces of the magnets are in intimate contact with the fuel flowing over the surfaces which are placing a polarizing charge as the fuel is forced towards the carburetor. Fuel leaves the unit entering into the inlet of the carburetor and through a filter,if a filter is located in the carburetor inlet, and then into the float chamber.

the fuel is metered into the throat of the carburetor to be mixed with the incoming air and is atomized with the charged particles of fuel now in droplet form being attracted to the oppositely charged air particles. In the atomized fuel air mixture are an approximately positvely and negatively charged ions, water vapor, dust particles which are drawn into the air horn

*This is a true copy of information provided by applicant; retyped for legibility.

The oppositely charged fuel air particles caused these to be attracted to each other. The like charged particles cause dispersion of the droplets so that due to the turbulence in the intake manifold and the negative charge on the intake manifold the negative charged fuel air droplets are repelled away from the intake manifold. The excess negative charges received from the negative magnetic field implements the repelling effect.

How it is used.

The magnets in the unit provide a means to place a polarizing charge on the flowing fuel. By placing the unit next to the carburetor and connecting unit to the fuel line with insulating fuel hose the charge is prevented from grounding. With engine stopped, the fuel in the unit remains in the magnetic field force. On starting, gasoline from the float chamber are first atomized causing easier statting.As long as the unit does not touch any magnetic metal the polarization of the fuel continues, either with the engine running or stopped. Spark plug wires or any electrical wiring must be at least 3/4 inches distant so electromagnetic interference cannot occur to the magnetic field.

By proper orientation of the charge on the permanent magnets it is possible to induce this polar charge on elements in the fuel. These elements in additives often provide nuclei for the formation of charged particles when in the carburetor and combustion chamger. Water,gasoline are non-solar solvents in pure state. When impurities are present in non-polar solvents they become conductive. Additives such as detergents, ionic and cationic surfactants can cause conductive reaction,i.e., polarization.

HISTORY OF

POLARION-X™

PATENTS PENDING

POLARION-X is a new product based on strong magnetic fields affecting fluids passing over a magnet surface. This causes gasoline to burn cleaner and more completely. The magnetic energy increases the combustion ratio to get more mileage from the tank of gasoline.

Japanese scientists working with magnets discovered electromagnetic forces can be used in fuel lines to increase combustion and cause a greater vaporization of hydrocarbon fuels and water. This is what happens in your carburetor where fuel and air are vaporized into a very fine mist and are drawn in the intake manifold and engine cylinder.

A fuel air mixture is ignited by the spark plug and the magnetic energy transfer provides better mixing to promote combustion. Slightly less fuel is used if the carburetor is adjusted when you have a tuneup to take advantage of the magnetic effect.

POLARION-X has very strong ceramic type magnets which are not as sensitive to engine heat and maintain their forces. This provides more energy and does not require any electrical current and will not cause any sparking or arcing in the fuel system.

Since it is also an energy saving device and does not use electricity from your alternator, less load is placed on the auto electric system.

A PRODUCT OF

AZ INDUSTRIES INCORPORATED

DISTRIBUTED BY

30 Day Warranty

If for any reason you are not satisfied with the performance of this unit, return to place of purchase for a full refund. You must return the unit within 30 days from date of purchase in original carton with proof of purchase.

Mfg. by AZ Industries, Inc.
Temecula, California
under license from
AZAKA, Inc.
Monrovia, California

PRINCIPLE OF

POLARION-X™

PATENTS PENDING

In other countries, high gasoline prices have caused the use of small fuel efficient cars. They have used the newer electronic systems to improve car performance.

As a result, the magnetic principle of POLARION-X was incorporated into the fuel system to promote better vaporization of the fuel and air to provide more complete combustion. Both electrical and electronic systems are based on + and − polarity; a magnet can do the same thing much more simply. It is safer as it cannot spark or cause a gasoline explosion from vapors and it conserves energy as no current is taken from the alternator.

When POLARION-X is installed with a tuneup, it will increase time between tuneups. With better combustion rate and cleaner burning of the fuel and air, there is less carbon deposit in the engine and an increase in fuel economy. Independent laboratories are testing the unit and find there is mileage improvement. Where POLARION-X has been tested on cars it was reported that there is easier starting and less dieseling when the engine is turned off. When engines are overhauled they were found to have less carbon deposit on the internal parts.

You can get these benefits by the use of POLARION-X which never wears out and needs no maintenance.

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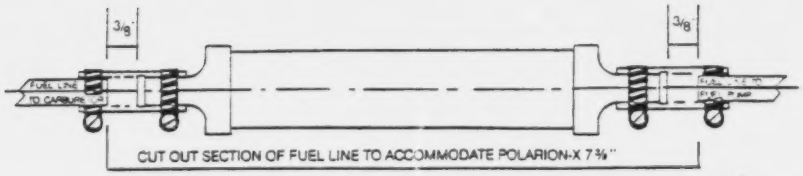
ATTACHMENT E

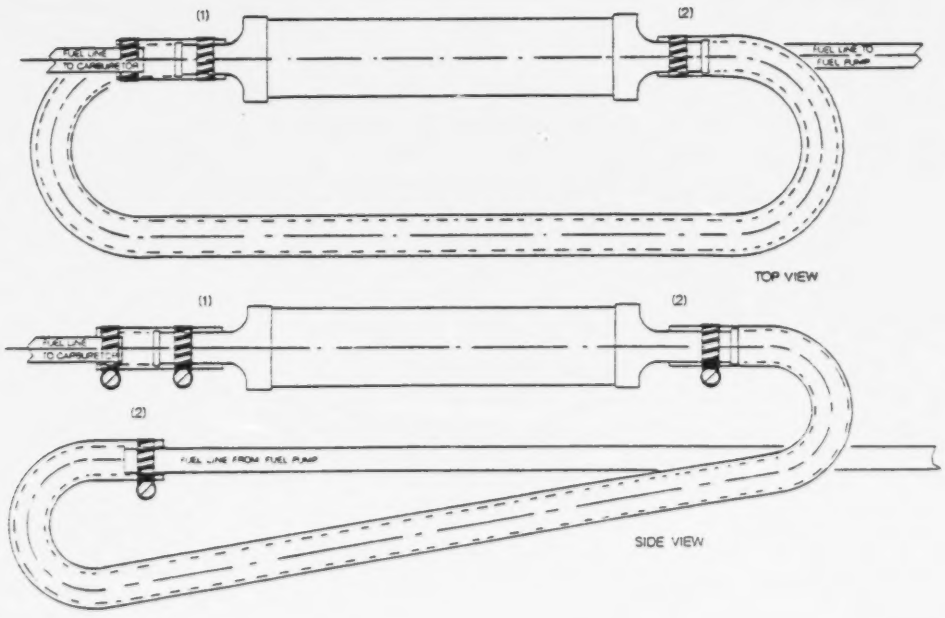
25



POLARION-X instruction installations
Tuneup is strongly recommended

1. Determine by holding unit alongside the fuel line where it will fit, free from touching engine, but as close as possible to carburetor. Mark the fuel line.
2. Remove fuel line or bend line for step 3.
3. Cut fuel line at the two marks PLUS 3/4 inch, which is 7 3/8 in. See sketch.
4. Cut a piece of fuel line hose 2 1/4 in. Slide two clamps, one at each end over hose and push end of unit into hose, leave 3/8ths in. space between unit and end of fuel line as shown. Tighten clamps, check for leaks before and after starting engine.

1. Determine by holding unit next to line where unit will fit, close to carburetor.
2. Slip two clamps over 2 in. piece of hose. Push hose over end of fuel filter nozzle. Push unit in other end and tighten both clamps. See sketch, top and side views.
3. Place a second piece of hose (2) to reach from opposite nozzle to end of fuel line by looping hose as shown. Cut hose proper length after making certain there are no kinks in looped hose line. Slide clamps over hose line and tighten clamp metal fuel line first. Position looped line with vinyl tape ties or duct tape to water hose of other supports as needed.



Transportation Testing Incorporated of Texas

Independent Tire and Vehicle Testing • 1601 San Antonio Highway • San Angelo, Texas 76903 • Phone 915/655-0580
P.O.Box 171, San Angelo, Texas 76902, USA

September 3, 1981

Mr. Al Kovacs
Azaka Co.
244 E. Pomona Ave.
Monrovia, California 91016

Dear Al,

In reference to our testing of your product, Polarian X Fuel Saver Device, we are furnishing you data related directly to E.P.A. emmission readings. Listed below you will find Co and HC readings prior to and after the installaion of your product.

		BEFORE		AFTER	
VEHICLE DESCRIPTION	ENGINE SIZE	Co	HC	Co	HC
1980 Ford T-Bird 2 Door	302 Cubic inch	2.3%	165 ppm	1.5%	110 ppm
1980 Mazda 626 2 Door	2000 cc	3%	230 ppm	2.7%	240 ppm
1980 Ford Mustang 2 Door	2.3 Liter	1.0%	270 ppm	.95%	260 ppm
1980 Ford Fairmont 2 Door	2.3 Liter	1.7%	290 ppm	1.5%	230 ppm
1980 Ford Fairmont 2 Door	2.3 Liter	4.0%	295 ppm	3.2%	290 ppm

In addition to the units listed above we will update you on a week to week basis of other units equipped with your product as to HC and Co readings.

Best Regards,

Ed Payne

Ed Payne

EP/lw

Transportation Testing Incorporated of Texas

Independent Tire and Vehicle Testing • 1601 San Antonio Highway • San Angelo, Texas 76903 • Phone 915/655-0580
P.O.Box 171, San Angelo, Texas 76902, USA

September 23,1981

Mr. Dale Diver
c/o Coast Machinery Movers
2419 Chico
South Del Monte, Calif. 91733

Dear Dale,

Enclosed you will find the pertinent data neded to complete the testing performed at our facility in conjunction with the SAE recommended practice J-1321.

On September 3, 1981, the testing involved your Polarian X fuel saver device mounted on a 1980 Ford Mustang (2.3 liter). The control vehicle was a 1980 Toyota Corolla (2.2liter). The following day, September 4, 1981, the same two vehicles were used but the Plarian X Fuel saver was removed. You shall find test data run sheets attached to this letter, along with MPG data calculation sheets.

The following items may be beneficial to you in trying to determine the amount of variables that were eliminated from your testing.

TEST COURSE:

A. 46 miles in length.
B. 4 lane highway (allowing for unnecessary stops)
C. U.S. 87 North (between San Angelo, Texas and Sterling City, Texas).
D. All asphalt road surface.
E. Divided highway allowing for U-Turns(uninterrupted test intervals).
F. Constant 55 mph speed limit.
G. Straight highway (no hills or inclines and very few winding curves).

DRIVER OVSERVATIONS:

A. Both vehicles ran smoothly.
B. No evidence of fuel flow problems.
C. No engine roughness.

DRIVERS AND OVSERVERS:

A. Control vehicle
DRIVER: Mr. Roger Zingg Jr.

Transportation Testing Incorporated of Texas

Independent Tire and Vehicle Testing • 1601 San Antonio Highway • San Angelo, Texas 76903 • Phone 915/655-0580
P.O.Box 171, San Angelo, Texas 76902, USA

OBSERVER: Mr. Dorman Height

B. Test vehicle
DRIVER: Mr. Matt Merritt
OBSERVER: Mr. Ken Joslin

TEST VEHICLES

A. Ballast was set at 85% load recommended tire size.
B. 1980 Ford Mustang tire size: P185/80R13
Inflation pressure: 26 PSI
85% load per test tire: 955 LBS.
C. 1980 Toyota Corona Tire Size: 175SR14
Inflation pressure: 24 PSI
85% load per test tire: 892 LBS.

POLARIAN X FUEL SAVER DEVICE

A. Test component was utilized in excess of 1000 miles prior to SAE fuel economy test.
B. Break-in period for Polarian X fuel saver device was consistent with test recommendations. (55 MPH speeds)

FUEL MEASUREMENT DEVICES

A. Fluidyne model 1228 totalizer.
B. Fluidyne model 214-135 transducer.

If you have any further questions please feel free to contact me in my San Angelo office.

Best Regards,

Edward Payne
Vice President and General Manager

EP/lw

MILES PER GALLON CONVERSION

WITH DEVICE/CONTROL VEHICLE

8.251	RUN #1
8.278	3
8.297	4
8.317	2A
8.199	3A
8.320	4A
49.662	6

49.662 LBS ÷ 6.0 = 8.277

46 MILES X 6 = 276

276 ÷ 8.277 = 33.35

BASELINE VEHICLE MILES PER GALLON

33.35 MPG ÷ 1.1915 = 27.99

TEST VEHICLE MILES PER GALLON

33.35 MPG ÷ 1.1312 = 29.48

TEST SEGMENT T/C RATIOS
WITH POLARIAN X FUEL SAVER

Test Run #1	1.1379
3	1.1372
4	1.1186

Average 3.3937 ÷ 3 = 1.1312

Baseline Segment

Test Run #2	1.1795
3	1.1980
4	1.1970

Average 3.5745 ÷ 3 = 1.1915

Percentage fuel saved = (Average baseline T/C - Average test T/C)÷ (Average Baseline T/C)

= (1.1915 - 1.1312) ÷ 1.1915

= (.0603) ÷ (1.1915)

= (.050608 x 100) = 5.0608% fuel saved

Percent Improvement = (Average baseline t/C - Average test T/C) ÷ Average test T/C

= (1.1915 - 1.1312) ÷ 1.1312

= (.0603) ÷ 1.1312

= (.053306 x 100) = 5.3306% Improvement

COMPARATIVE DATA RESULTS FROM POLARIAN X FUEL SAVER DEVICE

WITH DEVICE VS CONTROL VEHICLE

TEST RUN NUMBER	LBS FUEL CONSUMED TEST VEHICLE	÷	LBS CONSUMED CONTROL VHEICLE	=	T/C RATIO
1	9.389 1c		8.251 1c		1.1379
2	9.315 2c		8.386 2c		1.1107
3	9.414 3c		8.278 3c		1.1372
4	9.281 4c		8.297 4c		1.1186

TC values @ 98% confidence

Highest T/C ratio x .98 = minimum acceptable T/C ratio

1.1379 @ .98 = 1.1151 Range 1.1151 to 1.1379

DO NOT ACCEPT RUN 2 AS COMPARATIVE DATA.
DATA POINT IS BELOW RANGE.
THREE REMAINING DATA POINTS ARE ACCEPTABLE.

COMPARATIVE DATA RESULTS FROM POLARIAN X FUEL SAVER DEVICE

VS CONTROL VEHICLE

W/ DEVICE

TEST RUN NUMBER	LBS FUEL CONSUMED TEST VEHICLE	LBS CONSUMED CONTROL VEHICLE	T/C RATIO
1	9.726	8.367	1.1624
2	9.810	8.317	1.1795
3	9.822	8.199	1.1980
4	9.959	8.320	1.1970

TC values @ 98% confidence

Highest T/C ratio x .98 = minimum acceptable T/C ratio

1.1980 @ .98% = 1.1740 Range 1.1980 to 1.1740

DO NOT ACCEPT RUN #1 AS COMPARATIVE DATA.
DATA POINT IS BELOW RANGE.
THREE REMAINING DATA POINTS ARE ACCEPTABLE.

October 26, 1981

Mr. LaVern Adam, President
AZ Industries, Inc.
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

We received your letter of October 7, 1981 in which you applied for an EPA evaluation of the "POLARION-X", a fuel economy retrofit device.

Our Engineering Evaluation Group has made a preliminary review of your application and has identified several areas which require additional clarification. Our comments below address the individual sections.

1. Section No. 3 - Please provide a copy of the patent application.

2. Section 8(a) does not give a clear purpose for the POLARION-X. You state "The present device is a magnetic unit for treating hydrocarbon fuel and an improvement on previous electromagnetic devices developed ...". The benefits of electromagnetic treatment of a hydrocarbon fuel with respect to fuel economy and emissions of motor vehicles are not clearly demonstrated. Please explain this more fully. Also, the improvement over earlier electromagnetic devices is not shown. Please explain these improvements in greater detail.

3. Section No. 8(b) refers to the use of an electric field to "promote combustion, increase vaporization, and heat transfer." The exhibits also refer to electrical devices. However, since the POLARION-X is a magnetic device, the applicability of this information is not apparent. Please explain.

4. Section No. 10 and the installation brochure adequately describe the installation of the POLARION-X but it appears that additional hardware is required. Do you provide installation kits (hoses, fittings, etc.) to accompany the device? If so, please describe.

5. Section No. 10(e) states no adjustments are necessary after installation. However, the history of POLARION-X given as part of the installation instructions states "slightly less fuel is used if the carburetor is adjusted when you have a tune up to take advantage of the magnetic effect". What is this adjustment? How is it made? Please explain this inconsistency between the installation instructions in your application and the instructions accompanying the device.

6. Section 11 refers to the installation instructions for operating information. These instructions make no reference to the necessity for a mileage accumulation prior to obtaining a benefit. However, the "Abstract of Development of POLARION-X" states "Most engines would require preconditioning periods of up to 1000 miles before optimum fuel mileage was obtained." Please clarify. Is mileage accumulation required? If it is, how many miles? Are any benefits evident immediately after installation of the device? Are the benefits of the device still evident after its removal?

7. The test results in Section 15 contain several anomalies.

   a. The mileage on the Mustang at the end of testing on 9-3-81 was 36,119 miles but it started on 9-4-81 with 36,091 miles.

   b. Run numbers 1 w/p, 2 w/p, and 3 w/p each show 46 total miles. However, the odometer indicates only 36 miles.

   c. According to the odometer readings for the Corona, it appears the first run given for each day was a warm-up and should not be used for comparison. Since the Mustang ran at the same time, this also appears to be true for it.

   d. Section 54 of SAE recommended practice J1321 specifies a 5 minute interval between vehicles. However, the data shows both vehicles traveled together.

   e. The last fuel reading on test 1 w/p appears to be in error,

   f. The 2% bandwidth for acceptable data is correct. However, using .98 of the highest value to determine the lowest acceptable reading means you always automatically accept the highest reading even if it is the outlier and thus, valid lower values will be rejected. Plus or minus 1% of the mean or median would appear more acceptable.

   g. Was there mileage accumulation with the device prior to the 9-3-81 test of the Mustang? If so, how many miles?

   Please comment on 7a through 7g. Until our questions on these data and their analysis are satisfactorily addressed, we will be unable to properly evaluate the test results.

8. Also in Section 15, the test data was obtained in accordance with SAE over-the-road fuel economy test for heavy duty trucks and tractor-trailers. Although we will consider data which have been collected in accordance with other standardized fuel economy measurement procedures, the test procedures must be appropriate. The SAE passenger car fuel economy measurement procedures (either SAE J1082a and SAE 1256) would appear to be more appropriate. Please explain why the truck procedures were used.

9. What are the specific cleaims to be made for POLARION-X for emissions, fuel economy, and performance?

10. What is the suggested retail price of POLARION-X?

Submittal of the information requested above will be necessary to further process your evaluation. In order for us to process Section 511 applications efficiently, we have established a schedule for each. I ask that you respond to this letter by November 11. If you have any questions or require further information, please contact me.

Since processing your application will require you to submit test data obtained at a recognized independent laboratory, I am sending you a separate letter containing the current information on this procedure. I am prepared to assist you in developing a test plan which will allow you to conduct appropriate testing at an independent laboratory. Enclosed with that letter is an EPA test report on a device which appears to be similar to POLARION-X. It is entitled "Evaluation of the Super-Mag Fuel Extender". Even if you do not consider this device to be similar, you may find this report useful as an example of an EPA test program.

Sincerely,

/s/

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

October 27, 1981

Mr. LaVern Adam, President
AZ Industries, Inc.
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

This letter is in response to your request of October 7, 1981 for an EPA evaluation of POLARION-X. The Environmental Protection Agency is charged by Congressional mandate to evaluate fuel economy and emission control devices. While the EPA does not actually "approve" such devices, it does conduct evaluations for the purpose of increasing the common knowledge in the area. For this reason, the outcome of any testing by EPA becomes public information. It is this information which may be cited, although no claims can be made that any EPA findings constitute "approval" of the device or system.

Enclosed with this letter is a packet of materials which will assist you in developing a test plan which will allow you to conduct appropriate testing at an independent laboratory. This packet consists of 1) a document entitled "EPA Retrofit and Emission Control Device Evaluation Test Policy", 2) "Basic Test Plans and Testing Sequences", and 3) a copy of the applicable Federal Regulations.

A critical part of the application is the substantiating test data. The required test results will have to be obtained at a laboratory of your choice. Such testing would be conducted at your expense. A list of laboratories, which are known to have the equipment and personnel to perform acceptable tests, has been included in the enclosed packet. Please allow EPA to comment on your test plan before beginning testing at an independent laboratory. If you desire, we can assist in the development of a satisfactory test plan.

There are, however, several aspects concerning testing at an outside laboratory which I would like to bring to your attention at this time:

Minimum Test Requirements - Although different types of devices may require a more complex test plan, the minimum we require involves two vehicles and two test sequences run in duplicate. The vehicles should be selected from those listed in Table 1. Each vehicle is to be set to manufacturer's tune-up specifications for the baseline tests.

The tests are conducted in a "back-to-back" manner, once with the vehicle in baseline condition, and again with the device installed with no vehicle adjustments between tests. If installation of the device also involves some adjustments, e.g. timing, fuel-air mixture, choke, or idle speed, another test sequence with only these adjustments should be inserted between the first and last. If mileage

shown, then we would be able to say statistically at the 80% confidence level that there is a real improvement. Similarly, we would expect a minimum of 3% improvement for a fleet of 5 vehicles. Test results which display a significant increase in emission levels should be reason for concern.

Minimum Fuel Economy Improvements versus Size of Test Fleet

Fleet Size	Average Improvement Required
2	6%
3	5%
4	4%
5	3%
10	2%

Any EPA testing will be performed at no cost to you and you will be given the opportunity to concur with our test plan. Once this testing is complete, an evaluation report will be written. If no further testing is required, the report will be written solely on the basis of the test data submitted and our engineering analysis.

EPA intends to process your application in as expeditious a manner as possible. We have established a goal of twelve weeks from the receipt of a complete application to the announcement of our report. The attainment of this objective requires very precise scheduling, and we are depending on the applicant to respond promptly to any questions, or to submit any requested data. Failure to respond in a timely manner will unduly delay the process. In the extreme case, we may consider lack of response as a withdrawal of the application.

I hope the information above and that contained in the enclosed documents will aid you in obtaining the required independent laboratory testing for an EPA evaluation of your device. I will be your contact with EPA during the entire process. My address is EPA, Motor Vehicle Emission Laboratory, 2565 Plymouth Road, Ann Arbor, Michigan, 48105. The telephone number if (313) 668-4299. I have also enclosed a copy of an EPA report on the Super-Mag Fuel Extender. This device appears to be similar to the POLARION-X. Please contact me if you have any questions or require any further information.

Sincerely,

/s/

Merrill W. Korth, Device Evaluation Coordinator
Emission Control Technology Division.

Enclosures

accumulation is necessary in order to realize the full benefit, the same number of miles that are accumulated before the test runs must also be accumulated before baseline runs. When mileage accumulation is involved, duplicate tests must be run immediately after the device is installed and again after the mileage accumulation is complete. In addition, the method of mileage accumulation should be kept constant. Also, as a minimum, the test sequence shall consist of a hot-start LA-4 portion (bags 1 and 2) of the Federal Test Procedure (FTP) and a Highway Fuel Economy Test (HFET). The details of these tests are contained in the enclosed packet. Although only a hot-start FTP is required to minimize the costs to you, you are encouraged to have the entire cold-start test performed, since any testing and evaluation performed by EPA will be based on the complete FTP, and you may wish to know how a vehicle with your device performs over this official test. As a final requirement, the personnel of the outside laboratory you select should perform every element of your test plan. This includes preparation of the test vehicle, adjustment of parameters, and installation of the device.

Submission of Data - We require that all test data obtained from the outside laboratories in support of your application be submitted to us. This includes any results you have which were declared void or invalid by the laboratory. We also ask that you notify us of the laboratory you have chosen, when testing is scheduled to begin, what tests you have decided to conduct, allow us to maintain contact with the laboratory during the course of the testing, and allow the test laboratory to directly answer any questions at any time about the test program.

Cost of the Testing - The cost of the minimum test plan (two vehicles, two test sequences in duplicate) described above should be less than $3000 per vehicle and less than $6000 for the total test at any of the laboratories on the list. It should be recognized that additions to the minimum test plan (such as mileage accumulation, parameter adjustment, or additional testing) will result in additional costs. In any case, you will have to contact them individually to obtain their latest prices.

Outcome of the Tests - In order for EPA to best utilize our facilities, confirmatory testing will be performed only on those devices that demonstrate a statistically significant improvement in fuel economy or emissions based on data from an EPA-recognized independent laboratory. We have established some guidelines which will help you determine whether the test results with your device should be considered encouraging. These values have been chosen to assure both of us that a real difference in fuel economy exists, and that we are not seeing only the variability in the results. The table below presents the minimum number of cars that need to be tested for varying degrees of fuel economy improvement, assuming a typical amount of variability in fuel economy measurement. For a minimum test plan which was conducted on a fleet of two cars, the average improvement should be at least 6%. If at least a 6% difference in average fuel economy can be

"Precision Is Our Business"

AZ INDUSTRIES
INCORPORATED

28065 DIAZ ROAD, TEMECULA, CA 92390
(714) 676-6331

November 30, 1981

United States Environmental Protection Agency
Ann Arbor, Michigan 48105

Attention: Mr. Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Subject: Application for evaluation of "Polarion-X"

Reference: a. AZ Industries letter dated October 7, 1981
b. EPA letter dated October 26, 1981.

Enclosure: Patent application and correspondence

Gentlemen:

As requested in "referenced B" letter the following is additional clarification on our application for evaluation of the Polarion-X Unit.

1. Section Number 3 - See enclosure.

2. Section Number 8 (a) - The improvement is based on the increased magnetic lines of force with the placement of the magnet element. The previous ION-X and ATOM-X electromagnetic units produce approximately 450 gauss at the center of the unit. The POLARION-X unit measures approximately 750 gauss at the magnet surface to 1500 gauss equidistant between the surfaces .060 inches apart.

   The benefits of electromagnetic treatment of a hydrocarbon fuel with respect to fuel economy and emmissions of motor vehicles are the subject of many papers relating to combustion, vaporization and heat transfer. The scientific principles involved indicate that combustion rates are increased in a electromagnetic field, (i.e.) electromagnetic lines of force promoting increased vaporization and heat transfer for greater combustion efficiency. Brochure pages 30 & 31 list papers reporting the effects of electric fields, electromagetics and electrostatics on combustion relating to hydrocarbon fuel.

3. Section Number 8 (b) - Improvements of the magnetic unit over earlier electromagnetic units are (1) increased gauss readings, (2) no electrical potential required to activate the electromagnets and conserving energy from not being connected to the alternator. (3) The magnet unit cannot cause a spark which is a possibility with an electromagnet. (4) Ceramic magnets are capable of operating at engine compartment temperatures.

4. Section Number 10 - Additional hardware is not supplied due to the various engine configurations. Hoses and clamps of proper size are readily available for epecific engines from auto parts shops.

5. Section Number 10(e) - A tune-up is strongly recommended at time of installation. California prohibits any deviation from factory specifications for tune-ups. In states where adjustments are permitted a slightly leaner setting can be made. After the unit is installed and approximately 500 miles is accumulated full economy increase can be measured and emission byproducts are reduced.

6. Section Number 11 - The instructions make no reference to the necessity for a mileage accumulation propr to obtaining a benefit as it is assumed the purchaser already has some idea of his gasolene consumption before installation. Most purchasers, after installation would fill the tank, drive till empty and retop the gasolene level to the previous mark. Mileage driven divided by fuel used gives MPG consumption, so the vehicle would have to have mileage accumulation to measure performance. Depending on carbon deposits in the engine, most vehicles require 2 to 3 tanks of fuel to be consumed to clean out the engine and as this occurs gas mileage increases. Assuming the average car tank capacity provides 250 to 350 miles range, 2 to 3 tanks are approximately 500-1050 miles to show results. Yes, some vehicles show immediate benefits the first day. Benefits are observed after the unit is removed. This is confirmed by test vehicles with and without devices which are switched halfway between the test program and by exhaust emission readings of HC and CO which remained lower after completion of test programs.

7. Section 15 - (a.b.c.) Both test vehicles were equipped with transmissions that are not found on normally equipped type vehicles. These transmissions are prototype 1984 models and will be used on cars with much smaller tire sizes. Ultimately, the drive gears equipped with these units are smaller and cause a very high odometer mileage run-off.

   The test course was calibrated by using our Labeco 5th wheel system and test course mileage is correct. The vehicle speed was calibtated utilizing a Custom Signals hand-held radar system.

   In order to correct mileages shown on each run we had to adjust clerically. We acknowlege our clerical errors and will correct them.

   (d) Both vehicles were run at the same time using a spacing of 200 feet between test units. Vehicles were speed calibrated with our Custom Signal hand-held radalr. Professional drivers were used in the operation of this testing and proper spacing was maintained throughout testing. If vehicles had been seperated we would have certainly encountered a wind variable which is very common in the area of west Texas. This variable was never considered

in this test specification but we felt it would play an important role in the performance of fuel economy in both test vehicles.

(f) Plus or minus 1% of the mean or median would appear more acceptable. In dealind with products such as Polarian-X it might be best to consider the "worst case". It is a product which will be sold to the public as a fuel saver device and to consider the mean or median may become a misleading sales point. In working with strict regulations set forth by the E.P.A. many considerations should be taken to protect the integrity of one's product and the best measure to qualify such device is to use "worse case".

(g) Yes, the device had a mileage accumulation of 1252 miles prior to testing of the device.

8. In an effort to eliminate variables and to obtain consistency, our experience in over the road testing we believe the SAEJ1321 was more appropiate. Stop and go testing and acceleration, deceleration were secondary to recording fuel economy and performance. Our professional test drivers have operational patterns to eliminate as much as possible environmental factors and vehicle performance differences. Thier truck driving experience when testing passenger car performance gives more consistent data. We also find that there are less complexities of measurements with SAEJ1321 for both truck and passenger cars.

9. Emissions - Depending on engine conditions, can be reduced in a range from 5% to 10% for CO, 2% to 10% HCppm. Gas mileage improvements as measured by SAE methods 5%. Increased performance measuring various engine parameters 10%.

10. Suggested retail price of POLARION-X (35.00)

If additional information is required, please advise.

Sincerely,

for LaVern Adam
President

LA:rm

"Precision Is Our Business"

AZ INDUSTRIES
INCORPORATED

28065 DIAZ ROAD, TEMECULA, CA 92390
(714) 676-6331

December 11, 1981

United States Environmental Protection Agency
Motor Vehicle Emission Laboratory
2565 Plymouth Road
Ann Arbor, Michigan 48105

Attention: Mr. Merrill W. Koath
Device Evaluation Coordinator
Test and Evaluation Branch

Subject: Laboratory Testing Quotations Polarion-X Unit

Reference: EPA letter dated October 27, 1981

Enclosure: a. SCI letter dated October 29, 1981
b. Olson Engineering letter dated October 30, 1981
c. AESI letter dated November 17, 1981

Gentlemen:

Enclosures a, b, and c are copies of quotations for testing our Polarion-X gas unit.

In view of your comments regarding the cost of testing (EPA letter dated October 27, 1981) it is not clear as to exactly what tests are necessary to comply with EPA evaluation requirements.

It appears that their quotations are considerably higher than the $3,000 per vehicle as stated in your letter.

This product will be mainly marketed for carbureted engines with new design being developed for gas and diesel injection systems.

We will appreciate your reviewing the enclosed quotations and request your assistance in the development of a satisfactory test plan.

Sincerely,

A Z INDUSTRIES

for LaVern Adam
President

LA:rm

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR MICHIGAN 48105

December 14, 1981

OFFICE OF
AIR AND WASTE MANAGEMENT

Mr. LaVern Adam, President
AZ Industries, Inc.
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

We received your letter of November 30 in which you responded to our request for clarification of the information contained in your application for EPA evaluation of the "POLARION-X", a fuel economy retrofit device.

Our Engineering Evaluation Group has reviewed your responses and has noted several items that your reply apparently did not address or that still require clarification. Our comments below address the individual items.

1. Our letter of October 26 stated:

   "Section 8(a) did not give a clear purpose for the POLARION-X. You state "The present device is a magnetic unit for treating hydrocarbon fuel and an improvement on previous electromagnetic devices developed ...". The benefits of electromagnetic treatment of a hydrocarbon fuel with respect to fuel economy and emissions of motor vehicles are not clearly demonstrated. Please explain this more fully."

   Your letter of November 30 responded:

   "The benefits of electromagnetic treatment of a hydrocarbon fuel with respect to fuel economy and emissions of motor vehicles are the subject of many papers relating to combustion, vaporization and heat transfer. The scientific principles involved indicate that combustion rates are increased in a electromagnetic field, (i.e.) electromagnetic lines of force promoting increased vaporization and heat transfer for greater combustion efficiency. Brochure pages 30 & 31 list papers reporting the effects of electric fields, electromagnetics and electrostatistics on combustion relating to hydrocarbon fuel."

Your reply did not sufficiently answer our question. The reference you included with your application appeared to discuss the effect of an electric field on a fuel/air mixture during the actual combustion event while your device exposes only the fuel to a magnetic field. We are not aware of how the material in the reference relates to the principles of your device. In addition, the references listed on pages 30 and 31 of your application are not readily available and are apparently all given in Japanese. The only exception appears to be an article in Nature Magazine. This reference discusses electric fields.

Please explain more fully the benefits of magnetically treating an engine's fuel and provide technical papers or other appropriate documents (in English) that support your explanation.

2. Our letter of October 26 noted that the test data in item 7c of your application indicated that the first run each day was a warm-up and should therefore not be considered. You did not respond to this comment. Please inform us whether or not this first test was indeed a warm-up. Also please tell us how the vehicles were warmed-up and stabilized each day.

Submittal of the information requested will be necessary to further process your evaluation. I ask that you respond to this letter by December 23. If you have any questions or require further information, please contact me.

Sincerely,

/s/

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

UNITED STATES ENVIRONMENTAL PRCTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

OFFICE OF
AIR AND WASTE MANAGEMENT

December 18, 1981

Mr. LaVern Adam, President
AZ Industries, Inc.
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

We received your letter of December 11 in which you asked for our comments on the three enclosed quotations for testing the POLARION-X gas unit.

1. You said the cost quotations were considerably higher than the $3,000 per vehicle we estimated. As we stated in our policy letter, the costs of the minimum test plan (two vehicles, two test sequences in duplicate) should be less than $3,000 per vehicle and less than $6,000 for the total test at any of the laboratories. However, as we noted, mileage accumulation and additional device testing could add substantially to these minimum costs. A breakdown of the cost data you submitted for the three independent testing laboratories reveals that all three showed a cost for the minimum test plan which is very close to $3,000 per vehicle.

2. While we are striving to ensure that the testing performed at independent laboratories accurately assesses the capabilities of a device, we are also reviewing our test policies in order to minimize the cost of testi g. For devices that achieve their full benefit only after mileage accumulation, we recently decided that we would eliminate the requirement to test immediately after installation. This change will reduce the testing requirements on your device appreciably.

3. Your November 30 letter to us stated that approximately 500 to 1050 miles of driving with the device was required before the benefits were evident. The two quotations that included mileage indicated you only intended to accumulate 500 miles with the device before device testing started. We question whether its wise to accumulate mileage using the lower limit of the minimum mileage accumulation requirement. It would be unfortunate if the mileage accumulation interval was insufficient for an individual vehicle and you where to later deem additional device mileage accumulation and testing was necessary. To avoid this situation, we suggest you choose a mileage accumulation interval for which you can be sure the benefits of POLARION-X will be evident in testing.

4. The three quotations each discuss a variety of test options available to you. It appears that our Test Plan Code C (no parameter adjustments but mileage accumulation required) using Test Sequence Code 4 (claims for device on city and highway, and device does affect cold start) would be the most appropriate Test Plan/Test Sequence to use. On the other hand, Test Sequence Code 1 (claims for device on city and highway, and device does not affect cold start) would also be acceptable to us and would cost less.

   In planning your testing, please remember that Test Plan Code C no longer includes the testing formerly scheduled between device installation and mileage accumulation.

   Also please note in determining the number individual tests required by a given Test Plan and Test Sequence that we are referring to the number of valid tests on a vehicle that is in proper tune when tested.

Your letter of November 30 indicated you will be claiming a 5% fuel economy improvement based on SAE methods. If a similar improvement is expected in the FTP and HFET tests, you will need to test a minimum of three vehicles. If the average fuel economy improvement achieved in testing the device is less than 5%, you will need to test more than three vehicles to verify the fuel economy improvement.

Therefore, in order to minimize the potential costs to you, you may wish to test vehicles sequentially rather than as a group. On this basis you could initially test two or three vehicles. If the test results are not conclusive, you could schedule another complete test sequence on additional vehicles, one at a time, until the results become conclusive.

The preceding comments are based on the information currently available to us. As I noted in my letter of December 14, the benefits of magnetic treatment of fuel are still not evident to us and I therefore requested additional information. Your answers to my questions may affect the testing requirements.

I am prepared to assist you further in the development of your test plan. Please inform me of your progress by January 15. If you have any questions or require further information, please contact me.

Sincerely,

/s/

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

Enclosure

Rec'd 1-18-82
mwc

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AZ INDUSTRIES
INCORPORATED

28065 DIAZ ROAD, TEMECULA, CA 92390
(714) 676-6331

January 15, 1982

United States Environmental Protection Agency
Office of Air and Waste Management
Ann Arbor, Michigan 48105

Attention: Mr. Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Subject: Application for evaluation of Polarion-X
a. AZ Letter dated 7 October 1981
b. EPA Letter dated 26 October 1981

Reference: c. AZ Letter dated 30 November 1981
d. EPA Letter Dated 14 December 1981

Gentlemen:

In response to your letter of December 14, 1981 regarding our reply to questions you submitted in your October 26th letter, we submit the following information on clarification of comments in Section 8(a) and 7(c).

The purpose of the Polarion X Gas Unit is:

1. Increase fuel economy
2. Reduce exhaust emmissions
3. Eliminate carbon build up
4. Permit use of lower octane rated gasoline
5. Increase engine performance
6. Eliminate after running or dieseling

1. The paragraph beginning in our November 30th letter: " The benefits of electromagnetic treatment of a hydrocarbon fuel...." is not germane to Section 8 (a) and should not have been included under Section 8. Our intention was to comment on the similarity of the effect of a permanent magnet and an electromagnet. It was inappropriate to use an example

of electromagnetic treatment when the intent was to use magnetic treatment of hydrocarbons. We apoligize for the misuse of the term electromagnetic treatment.

Of the references listed on pages 30 and 31, only a few have been translated into English. We were informed the paper "Behavior of Fluids under Electric Field--Promotion of Combustion, Vaporization and Heat Transfer..." by Dr. Yukichi Asakawa is an abstract of some of his papers in English. This paper, dealing with behavior of fluids under electric field, explains the effects of using electromagnetic lines of force to induce reactions to take place. He writes of a "Reaction Velocity Theroy" to explain this behavior. By the use of magnetic lines of force generated by a permanent magnet we can achieve similar results as that obtained from electromagnetic lines of force generated from an electric field.

2. Item 7(c), warmup of vehicle was run on north course of track a distance of 70 miles for 1:15.5 hours at approximately 55 MPH as specified in SAE Practice J1321 which requires a 1 hour minimum warmup time. The odometer readings needed to be corrected due to the 1984 tire size that were on the vehicle at the time the tests were being conducted.

If additional information is required, please advise.

Thank you,

AZ INDUSTRIES

for Le Vern Adam
President

LVA:rm

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

January 21, 1982

Mr. LaVern Adam, President
AZ Industries, Inc.
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

We received your letter of January 15 in which you replied to our request for clarification of information contained in your previous correspondence. Your replies have answered all our questions about the POLARION-X except for the theory of operation.

As we stated previously, the fuel economy and emission benefits of magnetic treatment of a liquid hydrocarbon fuel are not clearly shown. The reference provided in your application discusses the effect of an electric field on a fuel/air mixture during the actual combustion event while your device only exposes the fuel to a magnetic field. This is the same reference you refer to in your letter of January 15.

Again I request that you explain more fully the benefits of magnetically treating the liquid fuel and provide technical papers or other appropriate documents (in English) that support your explanation.

Also in our telephone conversation of January 15, you said that you planned to begin testing of your device in mid-February. Please provide us a copy of the test plan so that we may review it and assist you in determining if the results will be acceptable to us. We are also interested in who will perform the testing and when it is to be completed.

Again, submittal of the information requested will be necessary to further process your evaluation. I ask that you respond to this letter by February 15. If you have any questions or require further information, please contact me at (313) 668-4299.

Sincerely,

/s/

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR MICHIGAN 48105

March 9, 1982

OFFICE OF
AIR, NOISE AND RADIATION

Mr. LaVern Adam, President
AZ Industries
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

We still lack two critical pieces of information before we can properly evaluate your device. As explained in our earlier letters and telephone conversations, we are obligated to publish our evaluation in the Federal Register. We cannot delay that action indefinitely. Therefore, I am forced to ask you again to provide the information we need or we will have to complete our evaluation and publish our conclusions with the information at hand.

The most important information we lack is substantive test data to support your claims for the device. We have yet to see your test plan for the test program you are about to initiate. As we explained, if we do not have the opportunity to review your plan, you run the risk of an oversight that might invalidate your whole effort. We recognize that such testing is expensive and want to ensure that your testing will meet our needs.

The other important piece of information is the designation of how your device causes a fuel economy improvement. The rather vague term "molecular theory" really does not help us in our evaluation process. We need a more detailed explanation.

Because of the inordinate amount of time that has passed since we first received your application and the difficulties encountered in getting the information in proper form for us to analyze, we are faced with the need to establish a deadline. That deadline is April 30. At that time, we will conclude our evaluation, with or without the requested information. We believe that that date allows more than enough time for our review of your plan and the conduct of the test program at an independent laboratory. At least three vehicles should be tested. If the data from the independent laboratory indicate a meaningful fuel economy or emissions benefit, EPA will perform confirmatory tests even though you may not wish to fully disclose the principle of operation for your device.

Please let us know when you send us the test plan what laboratory you have selected and the scheduled dates for your testing. If you have any questions about these requirements, please contact me immediately at (313)668-4299.

Sincerely,

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

Rec'd. 3-29-82
mrk

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AZ INDUSTRIES
INCORPORATED

28065 DIAZ ROAD, TEMECULA, CA 92390
(714) 676-6331

March 24, 1982

United States Environmental
Protection Agency
Motor Vehicle Emission Laboratory
2565 Plymouth Road
Ann Arbor, Michigan 48105

Attention: Mr. Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Subject: Test Program Polarion-X Unit

Reference: (a) EPA Letter Dated Dec. 18, 1981
(b) EPA Letter Dated Jan. 21, 1982
(c) EPA Letter Dated March 9, 1982

Enclosure: (a) Polarion-X Test Plan
(b) Copy Motor Trend Aritcle
(c) TTI Leter Dated Sept. 3, 1981 by John Geraghty
(d) California State University Letter Dated June 8, 1982
(e) Patents Granted-Magnetic Ferrous Attraction
(f) AZ Brochure Sheet-Polarion-X Unit
(g) Copy-Volume Magnetic Susceptibility

Gentlemen:

Confirming our phone conversation of March 23, 1982, we are submitting for your comments and approval our Basic Test plan for testing the Polarion-X Unit as shown on enclosure (a). The tests will be performed by a laboratory approved by EPA and you will be notified of our selection prior to starting the tests. We are presently getting revised quotations based on current EPA requirements.

In your letter of March 9, 1982, you advised that a dead line of April 30, 1982 had been established for completion of tests and final test results. While we will make every effort to expedite this program we beleive that additional time will be required and request an extension if the testing goes beyond this date.

Your letter of March 9, 1982, also requested further information and test data to support our claims for the device. Enclosures (b) thru (c) is additional information that may be helpful in your evaluation of the Polarion-X Device.

Mr. Al Kovacs of Azaka Company who has patent rights pending will submit under separate cover further explanation on our claims for the device.

It is respectfully requested that you review this proposal and advise at your earlist convenience.

Sincerely,

AZ INDUSTRIES

Dale V. Diver
Vice President

DD:gk

Enclosure

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AZ INDUSTRIES
INCORPORATED

28065 DIAZ ROAD, TEMECULA, CA 92390
(714) 676-6331

Basic Test Plans and Testing Sequence
AZ Polarion-X Unit

A minimum of three (3) cars will be tested under Section 511 of the Motor Vehicle Information and Cost Saving Act. Following is the test outline we propose:

Test Plan Code C
No Parameter Required
Mileage Accumulation Required

Testing Sequence
Code 1 or 4

Mileage
500 Mile Prior to installation of Polarion-X
500 Miles after installation

Type of Engines to be Used

General Motors	350 CID V8	1977
Ford Motor	351 CID V8	1978
Chrysler	318 CID V8	1975
AMC	258 L6	1981

Enclosure (a) thru (f)

Azaka Company
244 East Pomona Avenue
Monrovia, California 91016

March 25, 1982

United States Environmental Protection Agency
Motor Vehicle Emission Laboratory
2565 Plymouth Road
Ann Arbor, MI 48105

Att: Mr. Merrill Korth
Device Evaluation Coordinator
Test and Evaluation Branch

Subject: Additional Data on Fuel Treatment

Reference: Letter dated 9 March from EPA to LaVern Adam President AZ Industries Inc.

Enclosures: 1 Abstract of Development of POLARION-X
2 Principles of a Magnetic Device for Treating Hydrocarbon Fuels
3 List of U.S. Patents and Foreign Patents granted for Fuel Treatment

Mr. Adam requested I answer your inquiry for additional data on the theory of fuel treatment using magnetic fields. The principles relating ionization and polarization are explained in terms relating to the physical and electrical reactions that occur in the movement of the fuel, vaporization and combustion.

Sincerely,

Albert J. Kovacs

Albert J. Kovacs Owner
AzakaCompany
Monrovia CA 91016

Principles of a Magnetic Device for Treating Hydrocarbon Fuels

Fuel electrification occurs when a liquid such as a petroleum product flows past a solid or another fluid. The generation of static electricity varies widely among petroleum products and is unavoidable when moving hydrocarbons through a pipe or tube. Thus, fuel flowing in a pipe, through a filter, solids or water droplets settling through fuel, or fuel misting or spraying can generate static electricity. Essentially, it means separation of positive and negative charges. Since hydrocarbons are extremely poor conductors of electricity, such charges tend to accumulate as long as movement continues.

Conductivity of fuels is derived, in most part, from trace quantities of polar or ionic contaminants. Examples of such contaminants are various salts of acids, partially oxygenated compounds and asphaltenes. These are present in such great variety that measuring them is impractical.

In addition, the transfer of fuel from refinery to the tank of an automobile introduces other contaminants from handling, storage and pumping operations. Dust particles and magnetic microfines, dirt and water are substances usually found to be in the fuel system.

Most gasolenes are treated with additives, surface active agents which are addtional sources of ions along with those in the fuel, available to react when the fuel and air are mixed. During the vaporization process both charged ions in the fuel and the negative and positive ions in the air supply react to surround the atomized fuel droplets in the fuel-air mixture.

A charged droplet then becomes the nucleus to attract oppositely charged ions. A complex set of electrostatic reactions occur with the polarized ions in the fuel; the charged fuel droplet, negative and positive charged ions from the air causing the charged fuel droplets and the ions to be more widely dispersed in the fuel-air mass from the repelling effect of like charged ions.

Azaka Company
Monrovia CA 91016

This polarization develops conditions condusive to promoting a greater mixing of the fuel-air mixture to cause better combustion. First, a free active ion of OH,H,or O is necessary to initiate the series. In the second place, once such an ion enters into a reaction it produces both the oxidition product and a number of new active ions. A reaction of this sort is called a branched-chain reaction because the original active ion produced a number of new active ions. In this case the original OH ion produced three new active ions. Each of these will in turn tend to start a new chain of reactions, and the reaction rate in the fuel-air mixture as a whole will tend to increase rapidly.

Cracking of the large molecules to yield hydrogen and simpler forms of hydrocarbons and the partial oxidation of some hydrocarbons to form active intermediary compounds such as aldehydes, alcohols. peroxides,ketones and organic acids are some of the reactions that contribute to the complexity of the problem. The aldehydes, in particular, appear to play a very important part in hydrocarbon flames. Spectroscopic analysis always indicates their presence.

Conductivity of fuel molecules as mentioned previously,are derived from trace quantities of polar and ionic contaminants, various salts of acids, oxygenated compounds,etc., as well as rust, addititives,magnetic microfines, dirt and water. These contaminants, passing through a magnetic field are influences to various degrees, dependent on the magnetic and paramagnetic susceptibility,retaining this effect to react in attracting the free polarized ions as the fuel and air are atomized.

Since static electricity is present in fuels, advantage is taken of a magnetic field to increase the polarization of those elements in the moving fuel which can be effected. When fuel is atomized the polarized ions in the air supply a large increase of ions to augment the fuel droplet polarization and to promote the various complex reactions described above. The solid fuel can provide the means to initiate the ionization and the polarization process.

Azaka Company
Monrovia CA 91016

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR MICHIGAN 48105

April 2, 1982

OFFICE OF
AIR, NOISE AND RADIATION

Mr. LaVern Adam, President
AZ Industries
28065 Diaz Road
Temecula, CA 92390

Dear Mr. Adam:

We received your letter of March 24 which outlined your "Basic Test Plan and Testing Sequence AZ Polarion-X". The plan is acceptable to us and should ensure that the testing at an independent laboratory will accurately asess the capabilities of your device.

On the other hand, we cannot grant the time extension you requested. We believe it is reasonable to expect the testing to be completed and available to EPA by the deadline of April 30. You were originally advised of our testing requirements in my letter of October 27, 1981. I commented on the test quotations and suggested the appropriate testing options in my letter of December 18.

Again, please let us know what laboratory you have selected, the scheduled dates for testing and the testing sequence (Code 1 or Code 4) you select. If you have any questions about these requirements, please contact me immediately at (313) 668-4299.

Sincerely,

/s/

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

cc: Dale V. Diver, AZ Industries